layer 4.

As in the previous Office Action, **Adachi et al.** has been cited for teaching etchant containing hydrochloric acid and acetic acid to etch an InP layer (Table 1, page 1054), as well as for teaching an etchant comprising water and or hydrogen peroxide (Table 1, page 1054).

Applicants respectfully disagree.

Cooper et al. discloses in Fig. 3f (col. 8, line 67-col. 9, line 2) that the silox strip 18 is removed (etched) in a 40% aqueous solution of HF. **Cooper et al.** does not teach or suggest etching a layer such as the confinement layer 7 (n-InP).

The silox stripe 18 is a dielectric film primarily formed of SiO_2 and thus is not a III-V semiconductor material. As can be seen in Figs. 3a to 3e, the silox stripe 18 is used as a mask for selectively etching or growing the III-V semiconductor layer. Also, it is well known that the III-V semiconductor material such as InP is not etched by a 40% aqueous solution of HF. Referring to Fig. 3f, it can be seen that the shapes of the confinement layer 7 and the uppermost InP layer 4 has not changed from those shown in Fig. 3e. Therefore, there is no intention of etching the confinement layer 7 and the uppermost InP layer 4 of InP using a 40% aqueous solution of HP.

Accordingly, **Cooper et al.** does not disclose etching the stacked structure or the stepped structure. Further, it is clear that the composite structure is also not being etched.

Therefore, there is no motivation to apply the etchant of **Adachi et al.** to the structure of **Cooper et al.** to teach the present invention.

Thus, the 35 USC §103(a) rejection should be reconsidered and withdrawn.

② Claims 2, 17, 19 and 22 stand rejected under 35 USC §103(a) as unpatentable over U.S. Patent 4,719,633 to Yoshikawa et al. (hereinafter "**Yoshikawa et al.**") in view of **Otsuka et al.** and **Adachi et al.** (both previously applied).

Applicants respectfully request reconsideration of this rejection.

Yoshikawa et al. discloses a semiconductor laser and a method of producing the same wherein the semiconductor laser is produced by forming a stripe-shaped projection on the surface of a semiconductor substrate, and forming multilayered thin films with a double heterostructure including an active layer on said semiconductor substrate by using the metal organic chemical vapor phase epitaxial growth method or the molecular beam epitaxial growth method. Thus, a buried stripe-structure semiconductor laser can be produced by a sequence of crystal growth processes.

Otsuka et al. has been cited for teaching a planar surface on a (001) plane, as shown in Fig. 2A, 3C, column 8, lines 30-33 and column 14, lines 35-45, as recited in claims 17 and 19 of the instant application.

Adachi et al. has been cited for teaching the use of an etchant containing hydrochloric acid and acetic acid to etch an InP layer (Table 1, page 1054), as well as the use of an etchant comprising water and or hydrogen peroxide (Table 1, page 1054).

The Examiner urges that **Yoshikawa et al.** discloses forming a composite structure of a stacked structure and a stepped structure and etching the composite structure to planarize it. The Examiner further urges that the etchant can be hydrochloric acid: acetic acid, as disclosed in

Adachi et al. Also, the Examiner mentions that although **Yoshikawa et al.** describes an embodiment of GaAs type, it is described at col. 5, line 11 that it can also be applied to InP.

Referring to **Yoshikawa et al.**, an etching step is disclosed with is applied to the III-V semiconductor layer that is grown on the entire surface including a part that is directly above the stacked structure. The protruded part of the III-V semiconductor layer formed directly above the stacked structure is selectively removed by an etching step using a resist as a mask. The Examiner appears to assume that such a protruded part of the III-V semiconductor layer corresponds to the stepped structure of the present invention.

It should be noted that the III-V semiconductor layer etched in **Yoshikawa et al.** is only the GaAs layer (or the InP layer). For example, the projection part of the GaAs cap layer 14 that is regarded as the stepped structure is etched and only the GaAs layer above the plane 19 is removed. This is simply an etching process performed on the GaAs layer, and there is no intention in exposing the underlying $Ga_{1-x}Al_xAs$ clad layer 13. Rather, the etching process is stopped in the GaAs cap layer 14. Even if the cap layer 14 consists of the InP layer, the etching process will also be stopped in the InP layer.

Further, **Yoshikawa et al.** discloses etching the III-V semiconductor layer in another step. For example, projections of various shapes are formed on the GaAs substrate 10 by an etching step (see Figs. 2, 6, 11 and 14). All of these embodiments disclose etching only the GaAs layer and there is no $Ga_{1-x}Al_xAs$.

Thus, in **Yoshikawa et al.**, all etching processes on the III-V semiconductor layer are

performed on a single layer of the III-V semiconductor material consisting of one composition. For example, only the GaAs layer or only the InP layer.

On the other hand, **Adachi et al.** discloses an etching method on a multilayered structure of different compositions of III-V semiconductor layer such as InGaAsP/InP. Particularly, Table 1 on p.1054 disclose results regarding whether etching is possible or not for each of the InGaAsP and InP when using various types of enchants. In other words, the table discloses experimental data on the selectivity of an etching step for a combination of an InGaAsP layer and an InP layer.

Therefore, there is no motivation to apply an etchant used for a complex InGaAsP/InP multilayer structure and having a complex composition having a selectivity of etching to the structure of **Yoshikawa et al.** in which only a part of the InP layer is etched. **Adachi et al.** discloses etchants of hydrochloric acid and acetic acid. However, these are only used for a InGaAsP/InP multilayered structure that requires selectivity of an etching step. Therefore, there is no motivation for applying this to the simple laser structure of **Yoshikawa et al**.

The Examiner appears to maintain that **Otsuka et al.** teaches the claimed method including the steps of forming a stepped structure of InP and wet-etching the composite structure.

It should be noted that the Examiner states that InP ***layer 6 is grown at regions adjacent to the stacked structure to form a stepped structure of InP***. The Examiner points to Figs. 1A & 2A, 3C, col. 7, lines 9-15 and 30-35. Fig. 2A is a cross-section view showing the main portions of the laser shown in Fig. 1A. ***However, we note that the structure formed is not wet-etched as presently required.*** Rather, layer 7 is grown on layer 6, whereby a planar, not a stepped

structure of InP is formed.

If the Examiner is taking the position that layer 6 is "thinner" and stepped because it is wet-etched to be thinner, **Otsuka et al.** still does not disclose wet-etching a composite structure including a stepped structure of InP. The present claims require first forming the stepped structure and then wet-etching the composite structure.

Accordingly, even if **Otsuka et al.** forms the stepped layer 6, by wet etching, **Otsuka et al.** does not disclose wet-etching the resultant composite structure including the stepped layer 6, as presently required. Rather, **Otsuka et al.** teaches then growing layer 7 on layer 6.

Figs. 2 and 3 are described in **Otsuka et al.** at cols. 6 -10. At col. 7, lines 36-43, **Otsuka et al.** discloses wet-etching the stacked structure not having an adjacent InP layer, to form the structure shown in Fig. 3B. Figure 3 is most relevant and shows the process steps performed to form the laser shown in Figs. 1 and 2.

Thereafter, InP layers 6 and 7 are grown (with layers 14 and 15 in place), layers 14 and 15 are then removed (note that the structure produced by layers 6 and 7 is not "stepped"), InP blocking layer 8, pGaInAsP barrier reducing layer 9 and a p-GaInAs contact layer 10 are grown. Note that the structure after removal of layers 14 and 15, is not wet-etched. See Fig. 3. Electrodes are deposited (11 and 12), to obtain the structure shown in Fig. 3C.

Otsuka et al. does not teach wet-etching the above noted structure, let alone wet etching using an etchant containing hydrochloric acid and acetic acid, as presently required.

The Examiner states that **Otsuka et al.** teaches etching layer 20 using acetic acid and

thinning the InP layer 6. However, **Otsuka et al.** teaches at col. 7 and in Figs. 2 and 3, preferentially etching cap layer 14 using an acetic acid type etchant.

Thus, the 35 USC §103(a) rejection should be reconsidered and withdrawn.

In view of the aforementioned remarks, claims 2-5, 7-10, 12 and 15-25 are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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